



## Entrance Channel Design Tool

**Andrew Silver** 

Carderock Division, NSWC

Zeki Demirbilek

US Army Engineering Research and Development
Center

## Background

- Corps of Engineers designs entrance channels for the nation's ports and harbors
- Underkeel clearance a major factor in channel design
- US Navy developed Environmental Monitoring and Operator Guidance System (EMOGS) to assist deep draft Navy ships transiting shallow channels
- EMOGS predicts underkeel clearance before the ship transits the channel

# Corps of Engineers Requirements

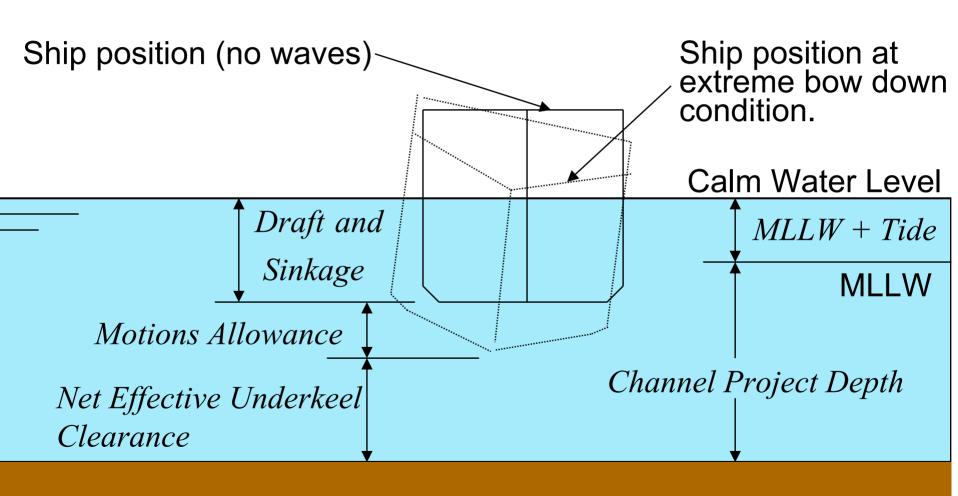
### Predict minimum underkeel clearance for:

- Any vessel type
- Any channel configuration
  - Width
  - Depth
  - Orientation
  - Channel Segment Length
- Using meteorological and oceanographic conditions either existing or hypothetical for economic assessment

# **EMOGS** Description

- Installed at two sites and predicts underkeel clearance for two different vessels
- Requires environmental input of the prevailing waves, astronomic and meteorological tide levels, and water depth for MLLW.
- Installed at the first site in 1989 and at the second site in 1995. Both sites are still using EMOGS for every transit.
- Upgraded periodically through the years.

### UNDERKEEL CLEARANCE



# Required Modifications to EMOGS

- Bundle with software that calculates sinkage and trim and ship response amplitude operators for shallow water
- Add flexibility to channel design
- Add flexibility to wave input

## Calibration/Validation

- Field data collected with ships transiting channels using DGPS.
- Water levels, currents, and waves also measured in the field locations
- Laboratory studies conducted to replicate the field measurements
- This database will be compared with model results for calibration and validation

# Projected Use of New Capability by Corps of Engineers

- Navigation studies: Planning & Design
- Engineering design of channels: width, depth, and alignment
- Predictor for: squat, trim, RAOs, and UKC
- Module for WES ship simulator
- Ship transit and risk assessment
- Operational tool for USCG and Port Authorities

### Contacts

#### Andrew Silver

Code 5500

Naval Surface Warfare Center, Carderock Division

9500 MacArthur Blvd.

Bethesda, MD 20817

Tel: (301) 227-5119

E-mail: SilverAL@nswccd.navy.mil

### • Zeki Demirbilek

Acting Chief, Coastal Hydrodynamics Branch

Engineer R&D Center

Coastal and Hydraulics Laboratory

3909 Halls Ferry Road

Vicksburg, MS 39180-6199

Phone: (601) 634-2834 or 1-800-522-6937 ext 2834

E-mail: Zeki.Demirbilek@erdc.usace.army.mil